What is claimed is:

1. A method of deriving the true magnitude of the terrestrial magnetic field **BZe** in the direction of the longitudinal axis **OZ** of a borehole penetrated by a bottom-hole assembly comprising a drill string including a substantially non-magnetic drill collar to which is attached a drilling bit assembly, said method comprising the steps of measuring the longitudinal magnetic field **BZa** (the component of the magnetic field **B** in the direction **OZ**) at a first predetermined point which is along the length of the drill string at a distance **a** from a fixed point along the length of the drill string, and measuring the longitudinal magnetic field **BZb** (the component of the magnetic field **B** in the direction **OZ**) at a second predetermined point which is along the length of the drill string at a distance **b** from said fixed point along the length of the drill string, to provide a longitudinal-position-dependent pair of longitudinal magnetic field measurements **BZa,BZb**, and calculating **BZe** from the relationship:

$$\mathbf{BZe = (BZa.a^2 - BZb.b^2)/(a^2 - b^2)},$$

on the assumption that a longitudinal magnetic field error is induced by a single notional magnetic pole in the drill string substantially at the attachment of the drill string to the substantially non-magnetic drill collar.

2. A method of surveying the heading of a borehole penetrated by a bottom-hole assembly comprising a drill string including a substantially non-magnetic drill collar to which is attached a drilling bit assembly; the method comprising:

deriving the true magnitude of the terrestrial magnetic field **BZe** by the method of claim 1;

measuring the magnetic fields **BX** and **BY** in two axes which are orthogonal to the longitudinal axis and to each other;

measuring gravity vector components in each of said three axes to produce respective gravity vector components **GX, GY** and **GZ**; and

solving the function **[GX,GY,GZ,BX,BY,BZe]** to determine said heading.

3. Apparatus for deriving the true magnitude of the terrestrial magnetic field **BZe** in the direction of the longitudinal axis **OZ** of a borehole penetrated by a bottom- hole assembly comprising a drill string including a substantially non-magnetic drill collar to which is attached a drilling bit assembly, said apparatus comprising magnetic field measuring means for measuring the longitudinal magnetic field **BZa** (the component of the magnetic field **B** in the direction **OZ**) at a first predetermined point which is along the length of the drill string at a distance **a** from a fixed point along the length of the drill string, and for measuring the longitudinal magnetic field **BZb** (the component of the magnetic field **B** in the direction **OZ**) at a second predetermined point which is along the length of the drill string at a distance **b** from said fixed point along the length of the drill string, to provide a longitudinal-position-dependent pair of longitudinal magnetic field measurements **BZa,BZb**, and means for calculating **BZe** from the relationship:

$$BZe = (BZa.a^2 - BZb.b^2)/(a^2 - b^2),$$

on the assumption that a longitudinal magnetic field error is induced by a single notional magnetic pole in the drill string substantially at the attachment of the drill string to the substantially non-magnetic drill collar.

4. Apparatus according to claim 3, in which said magnetic field measuring means comprises first magnetic field measuring means for mounting at a first predetermined point on said drill string, and second magnetic field measuring means for mounting at a second predetermined point on said drill string.

5. Apparatus according to claim 4, for use in carrying out the method according to claim 12, said apparatus further including:
third magnetic field measuring means for measuring the magnetic fields **BX** and **BY** in two mutually orthogonal axes each also orthogonal to the longitudinal axis; and
gravity vector component measuring means for measuring gravity vector components in each of said three axes to produce respective gravity vector measurements **GX, GY,** and **GZ**.

6. Apparatus according to claim 5, further comprising solving means constructed to solve the function **[GX,GY,GZ,BX,BY,BZe]** to determine said heading.

7 . Equipment for drilling a borehole and for surveying said borehole, said equipment comprising the operative combination of a substantially non-magnetic drill collar, a drilling bit assembly, and apparatus according to claim 3.

8. Equipment for drilling a borehole and for surveying said borehole, said equipment comprising the operative combination of a substantially non-magnetic drill collar, drilling bit assembly, and apparatus according to claim 5.

9. A method of deriving the magnetic azimuth of a borehole penetrated by a bottom-hole assembly comprising a drill string including a substantially non-magnetic drill collar to which is attached a drilling bit assembly; said method comprising the steps of:

measuring the uncorrected azimuth angle **AZa** at a first predetermined point which is along the length of the drill string at a distance **a** from a fixed point along the length of the drill string;

measuring the uncorrected azimuth angle **AZb** at a second predetermined point which is along the length of the drill string at a distance **b** from said fixed point along the length of the drill string;

thereby providing a longitudinal-position-dependent pair of uncorrected azimuth angle measurements; and calculating the corrected magnetic azimuth **AZc** from the relationship:

$$\cot(AZc).(b^2 - a^2) = b^2.\cot(AZb) - a^2.\cot(AZa)$$

on the assumption that a longitudinal magnetic field error is induced by a single notional magnetic pole in the drill string substantially at the attachment of the drill string to the substantially non-magnetic drill collar.

10. Apparatus for deriving the magnetic azimuth of a borehole penetrated by a bottom-hole assembly comprising a drill string including a substantially non-magnetic drill collar to which is attached a drilling bit assembly, said apparatus comprising azimuth angle measuring means for measuring the uncorrected azimuth angle **AZa** at a first predetermined point which is along the length of the drill string at a distance **a** from a fixed point along the length of the drill string, and for measuring the uncorrected azimuth angle **AZb** at a second predetermined point which is along the length of the drill string at a distance **b** from a fixed point along the length of the drill string, to provide a longitudinal-position-dependent pair of uncorrected azimuth angle measurements **AZa,AZb,** and means for calculating the corrected magnetic azimuth **AZc** from the relationship:

$$\cot(AZc).(b^2 - a^2) = b^2.\cot(AZb) - a^2.\cot(AZa)$$

on the assumption that a longitudinal magnetic field error is induced by a single notional magnetic pole in the drill string substantially at the attachment of the drill string to the substantially non-magnetic drill collar.

11. Apparatus according to claim 10, in which said azimuth angle measuring means comprises first azimuth angle measuring means for mounting at a first predetermined point on said drill string, and second azimuth angle measuring means for mounting at a second predetermined point on said drill string.

12. Apparatus according to claim 11, said apparatus further including:

magnetic field component measuring means for measuring magnetic field components in each of three mutually orthogonal axes to produce respective magnetic field measurements **BX, BY** and **BZ**; and

gravity vector component measuring means for measuring gravity vector components in each of said three axes to produce respective gravity vector measurements **Gx, Gy** and **Gz**.

13. Apparatus according to claim 12, further comprising solving means constructed or adapted to solving the function **[GX,GY,GZ,BX,BY,BZ]**.

14. Equipment for drilling a borehole and for surveying said borehole, said equipment comprising the operative combination of a substantially non-magnetic drill collar, a drilling bit assembly, and apparatus according to claim 10.

15. Equipment for drilling a borehole and for surveying said borehole, said equipment comprising the operative combination of a substantially non-magnetic drill collar, a drilling bit assembly, and apparatus according to claim 14.